

---

## Chapter 4

# Benefit/Cost Analysis

The data described in Chapter 3 provided the basis for performing the benefit/cost analysis, which compared the estimated costs of I/I reduction to the estimated costs of planned conveyance system improvement (CSI) projects<sup>1</sup>.

This chapter describes how the benefit/cost ratio for a proposed I/I reduction project was calculated and how cost effectiveness was defined. It explains how the Benefit/Cost Analysis Tool (B/C Tool) was used to identify a proposed cost-effective I/I reduction project. In addition, this chapter describes variables that impact the cost effectiveness of a proposed I/I reduction project, including: the methods used to identify CSI projects that would no longer be needed or could be downsized, methods used for selecting specific mini-basins and techniques for I/I reduction, and the factors that influenced the use of data in the benefit/cost analysis.

The benefit/cost analysis results presented in this chapter identify cost-effective I/I reduction projects that would be necessary to implement the three I/I reduction alternatives described in Section 3.2.6. These include: (1) evaluating the cost-effectiveness of achieving a regional I/I reduction goal of 30 percent; (2) evaluating I/I removal from a regional approach (re-investing all savings from cost-effective I/I reduction projects in additional I/I reduction projects until the savings are exhausted); and (3) evaluating I/I removal on a project-specific basis (evaluating each planned conveyance facility on its own merit).

This chapter also presents the results of a Sensitivity Analysis performed at the request of the E&P Subcommittee. The Sensitivity Analysis demonstrates the impact that a different set of effectiveness and cost assumptions would have on the cost-effectiveness results. Figure 4-1 shows how the data described in Chapter 3 provided input to the benefit/cost analysis.

---

<sup>1</sup> This refers to the CSI projects as presented in Chapter 3 of this Report and as described in detail in the March 2005 *Regional Needs Assessment Report*.

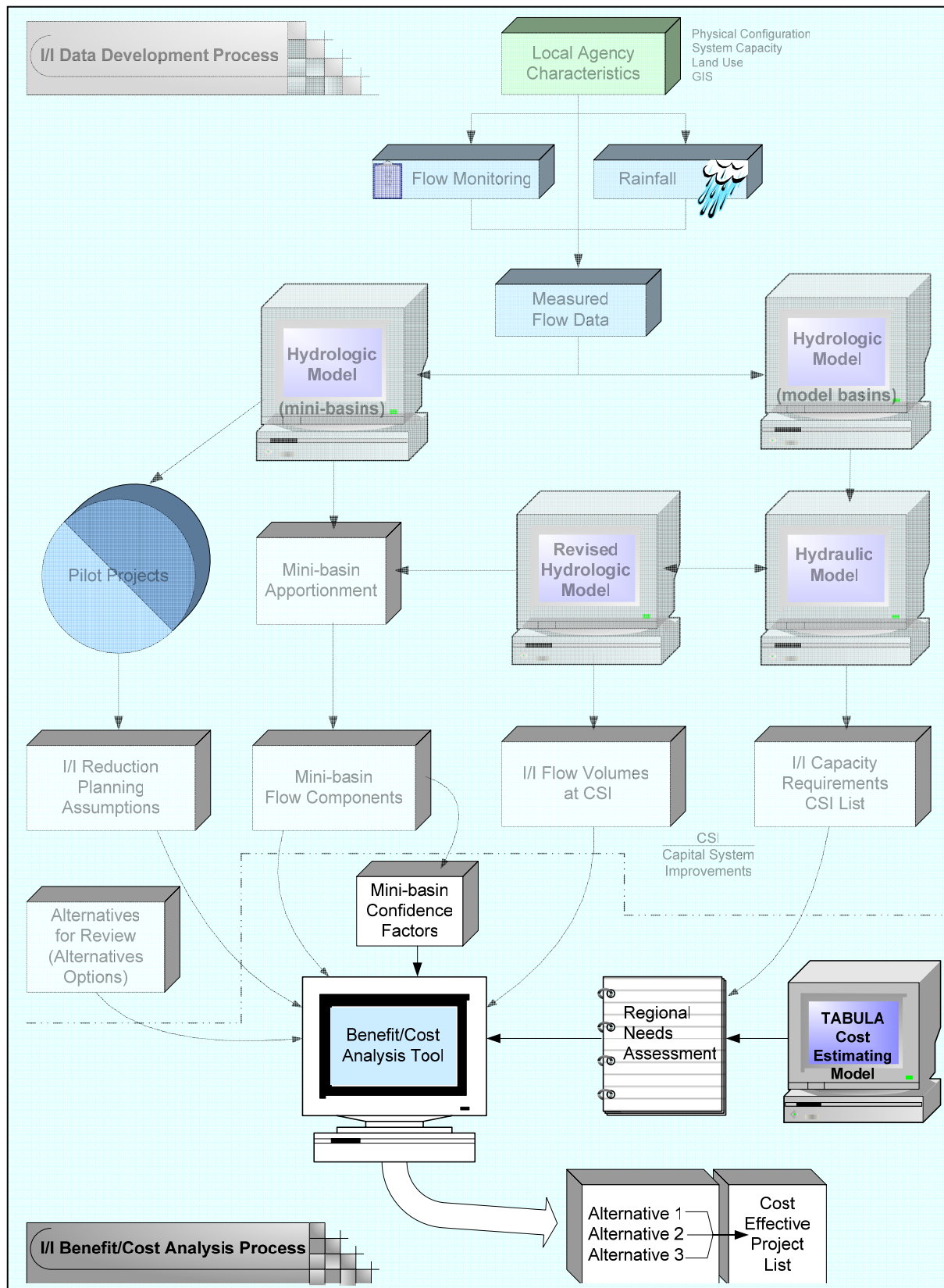


Figure 4-1. Benefit/Cost Analysis Process

## 4.1 What Defines Cost Effectiveness?

To evaluate cost effectiveness, a benefit/cost ratio was calculated for each candidate conveyance system improvement (CSI) project<sup>2</sup>:

$$\text{Benefit/Cost Ratio} = \frac{(\text{CSI Project Savings After I/I Reduction})}{(\text{Cost of Proposed I/I Reduction Project})}$$

A proposed I/I project was considered cost effective if the CSI savings resulting from the I/I reduction project were greater than the cost of I/I reduction. All cost-effective projects had a benefit/cost ratio greater than 1.

For some cost-effective projects, the need for a CSI project could be eliminated; in other cases, the CSI projects could be significantly downsized, but some CSI work would still be needed. In all cases, for a project to be considered cost effective, the cost of I/I reduction plus the cost of any remaining CSI work had to be less than the cost of the originally planned CSI project without I/I reduction. Examples of how projects were evaluated for cost effectiveness are included below.

### Example 1: Project-Specific Evaluation of Cost Effectiveness

Based on the definition of project-specific (Alternative 3; see Section 3.2.6 of this Report) cost effectiveness used for this analysis, all projects considered cost-effective had a benefit/cost ratio greater than 1. An example of a hypothetical project-specific cost-effective project using this definition is provided below.

Original CSI project cost:	\$30 million
Cost to do I/I reduction work:	\$10 million (cost)
Savings to CSI project resulting from I/I reduction (that is, project is downsized):	\$15 million (benefit)
Benefit/cost ratio:	1.5

In this example, the *benefit* is the \$15 million saved. This number was compared to the *cost* of the I/I reduction work. The benefit/cost ratio is therefore \$15 million divided by \$10 million, which equals a benefit/cost ratio of 1.5.

### Example 2: Regional Evaluation of Cost Effectiveness

When evaluating I/I reduction for cost effectiveness from a regional standpoint (Alternative 2; see Section 3.2.6 of this Report), I/I reduction was considered cost effective if the total CSI savings resulting from the I/I reduction projects was equal to the cost for I/I reduction.

<sup>2</sup> This refers to the CSI projects as presented in Chapter 3 of this Report and as described in detail in the March 2005 *Regional Needs Assessment Report*.

For example, a series of I/I projects would be considered cost effective if the combined CSI savings resulting from the I/I reduction project was equal to the cost of the combined I/I reduction. Based on the definition of regional cost effectiveness used for this analysis, the combined regional cost-effective projects must have a benefit/cost ratio greater than or equal to 1. An example of a hypothetical regional cost-effective project using this definition is shown below.

**Project 1:**

Original CSI Project 1 cost:	\$30 million
Cost to do Project 1 I/I reduction work:	\$10 million (cost)
Savings to CSI project resulting from I/I reduction (that is, Project 1 is downsized):	\$15 million (benefit)

Funds available for regional reinvestment are \$5 million (\$15 million minus \$10 million).

**Project 2:**

Original CSI Project 2 cost:	\$20 million
Cost to do Project 2-I/I reduction work:	\$10 million (cost)
Savings to CSI project resulting from I/I reduction (that is, Project 2 is downsized):	\$5 million (benefit)
Project 2 I/I reduction project overage:	\$5 million (excess)

Using the Regional approach, the excess savings from Project 1 (\$5 million) are reinvested in Project 2 (\$5 million).

Net Cost to do Project 1 & 2 I/I reduction work:	\$20 million (cost)
Net Savings to CSI Projects 1 & 2 from I/I reduction (that is project 1 & 2 downsized):	\$20 million (benefit)

Benefit/cost ratio:	1
---------------------	---

The benefit/cost ratio is equal to 1; therefore, the regional approach to implementing I/I reduction for Project 1 and Project 2 is cost effective.

**Example 3: 30-Percent Evaluation of Cost Effectiveness**

When evaluating the cost effectiveness of achieving a regional I/I reduction goal of 30 percent, the benefit/cost ratio was calculated to determine if it exceeded a ratio of 1:1. A benefit/cost ratio of less than 1 for achieving 30-percent I/I reduction was not considered cost effective.

An example of a hypothetical 30-percent I/I reduction project is shown below.

Amount of I/I reduction (30 percent):	100 million gallons
Cost to achieve 30-percent reduction:	\$500 million (cost)
Capital facilities improvement reduction:	\$300 million (benefit)
Benefit/cost ratio:	0.6

The benefit/cost ratio is less than 1; therefore, the 30% I/I reduction project is not cost effective.

The three alternative approaches for evaluating the cost effectiveness of I/I removal (project-specific, regional, and 30-percent target goal) are presented in Section 4.6 for the E&P Assumptions and the Sensitivity Analysis Assumptions.

## 4.2 Benefit/Cost Analysis Tool Process Steps

The Benefit/Cost Analysis Tool (B/C Tool) is a database analysis tool that evaluates I/I reduction as an alternative to building new or larger CSI projects. The County determined that using the B/C Tool was the best method for evaluating identified CSI facilities, model basins, mini-basins, alternative cost-effectiveness approaches, and large numbers of additional variables.

The B/C Tool helped determine the optimal I/I reduction available to eliminate or downsize a proposed CSI project. The B/C Tool estimated the costs and/or savings of completing an I/I rehabilitation project. It was developed using a Microsoft® Access platform. Using this software platform was necessary for storing the large quantities of information required for calculating the cost effectiveness of an I/I rehabilitation project.

The B/C Tool tested a method for I/I remediation based on the number of laterals, pipe age, and total I/I available in a basin. This selection could be overridden by the analyst in the B/C Tool if necessary to achieve a greater amount of I/I reduction. Factors that could impact the selection of alternative I/I reduction methods included variables such as cost factors, level of confidence for the mini-basin data, or modified I/I reduction approaches.

With the mini-basins and a remediation technique selected, the B/C Tool generated the estimated cost necessary to perform the proposed I/I reduction work. Specific cost assumptions included in the B/C Tool were those adopted by the E&P Subcommittee (see Table 3-9 for E&P assumed unit costs and Table 3-10 for allied costs).

The sum of the I/I reduction was exported from the B/C Tool into an output file. This output file was processed by the County, where the file was imported into the regional conveyance system hydraulic model and the output from the hydraulic model used to recalculate the capital facility costs using TABULA software (see Section 3.2.4.9 for a description of TABULA). Finally, the output from TABULA and the hydraulic model was re-entered in the B/C Tool, which compared the reduction in capital costs (if any) to the cost of I/I rehabilitation. The results of the comparison determined if the I/I rehabilitation project was cost effective.

Based on the TABULA and hydraulic model results, adjustments to the selected mini-basins or I/I removal technique around a particular facility sometimes occurred. When this occurred, the current settings in the B/C Tool were saved with a unique “iteration” number before any changes were made. This allowed for recall of previous iterations if the changes were less cost effective than the original settings.

For the analyses performed using the E&P Assumptions and costs and the Sensitivity Analysis (Initial) Assumptions and costs, the iteration numbering convention was as shown in Table 4-1.

**Table 4-1. Iteration Numbering Convention,  
E&P and Sensitivity (Initial) Costs and Assumption Analysis**

<b>E&amp;P Costs and Assumptions</b>	<b>Purpose</b>
Iteration 1.10 & 1.01	Independent analysis of single facilities
Iteration 1.11, 1.12, 1.13, 1.14...	Revised analysis of single facilities (if necessary)
Iteration 1.60	All final cost-effective facilities runs
Iteration 1.61	All runs impacted by final cost-effective facilities
<b>Sensitivity Analysis (Initial) Costs and Assumptions</b>	
Iteration 3.01	Independent analysis of single facilities
Iteration 3.02, 3.02, 3.03, 3.04...	Revised analysis of single facilities (if necessary)
Iteration 3.10	All final cost-effective facilities runs and all runs impacted by final cost-effective facilities

If one or multiple iterations resulted in a cost-effective I/I project, the most cost effective project was selected. When analysis continued at upstream or downstream locations, the impacts of an approved project were reflected in the related analyses. The effects of a cost-effective project might or might not be carried forward if those same savings could be rolled into another, more cost-effective upstream or downstream project.

After all likely combinations of mini-basins and associated I/I reduction were exhausted, the iteration closest to being cost effective was flagged and placed on a Select List (see Section 4.5 for a description of the Select List). Analysis of the next downstream facility then occurred. If a project downstream was determined to be cost effective, all upstream facility analyses were revisited and the effects of the downstream project were included. The iteration on the Select List was also revised.

Before the evaluation started, prospective improvements to the regional conveyance system were identified – the total of 63 different “facility improvements” of different types (Table 4-2) were identified as “needed” and sized utilizing the hydraulic model and parameters described in Chapter 3. An additional hydraulic analysis was then completed to estimate a “target” level of I/I reduction necessary to reduce, delay, or eliminate the needed facility improvement. For each needed facility improvement, approximate costs for construction, schedule, and operation/maintenance were determined.

**Table 4-2. Types of Facility Improvements**

- Construction of new or expansion of existing pump station and/or force main
- Modification to existing wastewater treatment plant
- Construction of new parallel line for interceptor
- Construction of new conveyance storage facility
- Upsizing of existing interceptor (for example, from 36-inch diameter to 40-inch)

Next, a list of prospective I/I rehabilitation projects was identified and evaluated to ensure that they met a set of “minimum” criteria. Under the first minimum criterion, mini-basins with less than 3,500 gpad<sup>3</sup> were excluded as candidates for I/I reduction. A second criterion set a minimum I/I level of 3,500 gpad for any mini-basin, regardless of the I/I reduction technique selected or the initial level of I/I in the targeted basin. It was determined that mini-basins that fell below the minimum gpad after I/I reduction needed to have their I/I reduction flows and associated costs reduced until the 3,500-gpad level was met. These criteria for establishing a maximum value for I/I removal success were based on experience from the 10 pilot rehabilitation projects described in Section 3.2.5 and were approved by the local agencies and the County.

Out of all the mini-basins in the regional service area, a total of 450 mini-basins qualified as potential I/I rehabilitation projects for I/I reduction. For each qualifying mini-basin, the four rehabilitation strategies outlined in Table 3-7 were evaluated through the technique selection process described in Section 3.2.5.3 to determine if the level of I/I reduction estimated for the selected rehabilitation technique could achieve the targeted level of I/I reduction.

The process of selecting one of the four I/I reduction techniques may have many iterative steps prior to selecting a preferred I/I reduction project(s) alternative. The selection process utilizes the combined information developed through the hydrologic model, pilot projects and I/I rehabilitation assumptions to identify the I/I reduction technique resulting in the lowest cost per gallon of I/I removed. The lowest cost per gallon technique for I/I reduction is used unless it fails to achieve the targeted level of I/I reduction needed to delay, reduce or eliminate a planned CSI facility. Under that condition, an alternative I/I reduction technique is selected and evaluated to determine if it will reach the targeted level of I/I reduction and if the I/I reduction effort is cost effective. This process of implementing the B/C Tool to identify one or more mini-basins (I/I rehabilitation projects) is illustrated in Figure 4-2 and described in the 11-step process that follows.

<sup>3</sup> A 3,500-gpad threshold was established based on the results of the 10 pilot projects; in some mini-basins, rehabilitation of sewer system components did not result in I/I reduction levels of less than 3,500 gpad. For more information about I/I reduction and rehabilitation effectiveness, see Sections 8.6 and 8.7 of the *Pilot Project Report* (October 2004).

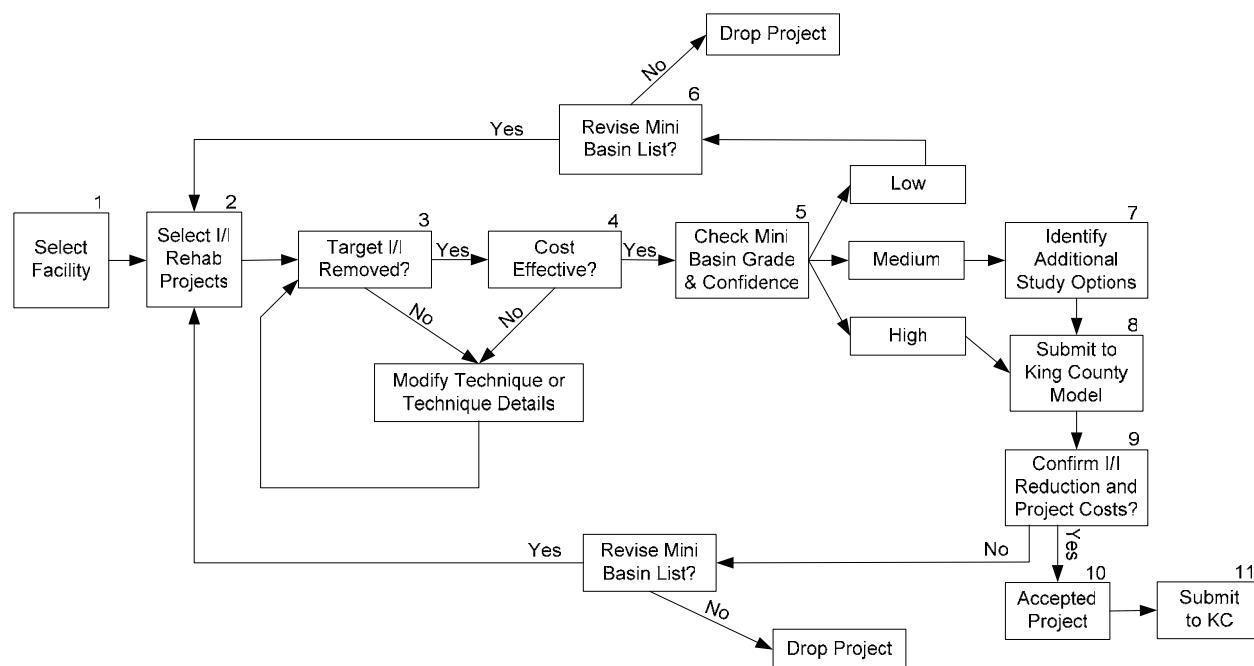


Figure 4-2. Alternatives Selection Process

### Step 1 – Select Facility

Beginning at the most upstream point of each regional wastewater treatment plant basin, conveyance facility improvements (as identified in the Regional Needs Assessment) were selected and target levels of I/I reduction were identified. Preliminary downstream I/I reduction was calculated to identify if additional downstream “benefits” could be achieved.

### Step 2 – Select I/I Rehabilitation Projects

The mini-basins were selected based on least cost per gallon for I/I reduction and a rehabilitation technique was chosen from those described in Section 3.2.5.3. Once a technique was selected, the I/I reduction assumptions were applied to one or more mini-basins that qualified for rehabilitation until the level of I/I removal was comparable to the target level of I/I impacting the facility. If there was inadequate I/I flow to eliminate the need for the identified conveyance facility improvement, a possibility still existed for delaying construction or reducing the size of the proposed facility.

### Step 3 – Targeted I/I Removed?

The mini-basin hydrologic model was then used to simulate a long-term rainfall condition to estimate peak flows in the mini-basin before and after rehabilitation, and to determine if the targeted level of I/I was achieved. If the target level of I/I reduction was not achieved, then Step 2 needed to be repeated and other I/I removal techniques considered, or additional mini-basin rehabilitation projects added if available.

### **Step 4 – Cost Effective?**

Once the targeted level of I/I reduction was achieved as described in Step 3, then the I/I reduction costs were calculated for the targeted mini-basins. These costs were based on the I/I reduction technique selected, the quantity of work to be done, and the unit costs for the associated I/I reduction (see Section 3.2.5.3 for a description of I/I rehabilitation assumptions and Section 3.2.5.4 for cost assumptions). A mini-basin's I/I reduction flows and costs were proportioned if they fell below the minimum gpad limit after rehabilitation. I/I removal efficiency factors were modified and then rounded up to the nearest 10 percent.

This projected cost of I/I reduction was then compared with the projected cost of a conveyance facility improvement (see Table 3-3 for conveyance facility cost assumptions) that would be needed without the I/I reduction. If the CSI facility cost was less than the cost of the proposed I/I reduction, then another I/I reduction technique or set of mini-basins might require evaluation. In some cases, the maximum extent of I/I reduction only reduced the size and cost of a proposed CSI facility and did not entirely eliminate the need for the facility improvement. In this situation, the cost of the I/I rehabilitation was compared to the CSI cost savings from the proposed I/I reduction and not the original estimated conveyance facility improvement cost.

### **Step 5 – Check Mini-Basin Grade and Confidence**

This step took into consideration the confidence factors for each mini-basin data based on the quality of flow monitoring data for each mini-basin (as previously described in Section 3.2.4.8). The criteria for establishing the confidence in a mini-basin was used to qualify a targeted mini-basin as having low, medium or high confidence in the quality of its flow data.

### **Step 6 – Low Confidence/Revise Mini-Basin List**

If the level of confidence for a targeted mini-basin was determined to be low, a revised list of mini-basins that did not include mini-basins with low confidence was considered for evaluation, if possible. If that was not possible, the mini-basins with low confidence were reassessed to determine if a lower value of I/I for the mini-basin could be used with an acceptable level of confidence. If this was not possible, then the I/I reduction project for the conveyance facility improvement under analysis was dropped from consideration.

### **Step 7 – Medium Confidence/ Identify Additional Study Options**

If the level of confidence for a targeted mini-basin was determined to be medium, additional study options were recommended to confirm, if possible, the sources of I/I within the targeted mini-basin. This would also apply to any low confidence mini-basins selected for rehabilitation in Step 6 above. An example of this was a recommendation that mini-basin field investigations of possible I/I sources be completed and evaluated prior to proceeding with implementation of the I/I reduction project.

### **Step 8 – High Confidence/ Submit to County for Hydraulic Model Evaluation**

The I/I reduction (as estimated in Steps 2 and 3) for the targeted mini-basins rating a medium or high level of confidence were submitted to the County for verification of the I/I reduction at the targeted CSI facility.

### **Step 9 – Confirm I/I Reduction and Projected Costs**

Confirmation of I/I reduction and projected costs was accomplished through the use of the model basin hydrologic model and the County hydraulic model. The hydrologic and hydraulic models simulated a long-term rainfall (60-year) record to estimate peak flows in the County conveyance system after I/I removal and to determine if the targeted level of I/I was achieved. If the target level of I/I reduction was not achieved, then other I/I removal techniques were considered, or additional mini-basin rehabilitation projects were added, if available. If either of these two options was possible, then Steps 2 thru 9 were repeated until the I/I reduction project was accepted for submittal to the County. In those cases where it was not possible, the I/I reduction project for the targeted conveyance facility improvement was dropped from consideration

### **Step 10 - Accept I/I Reduction Project**

Once the targeted level of I/I reduction was verified in Step 9, then the proposed I/I reduction project, the projected I/I reduction, and the estimated cost developed in Step 4 for the I/I reduction project were accepted.

### **Step 11 - Submit I/I Reduction Project to County**

Once an I/I reduction project was accepted as a cost-effective project, a complete benefit/cost analysis package was prepared and submitted to the County for review and approval.

A Facility Benefit/Cost Analysis Cover Sheet was prepared for each I/I reduction project determined to be cost effective, and presented a summary of I/I flow and cost information utilized in the analysis, including:

- Listing of mini-basins used
- Upstream and downstream impacts
- Overall costs of the CSI facility improvements with and without the I/I project
- Benefit/cost ratio
- Net project cost or savings

Each I/I reduction project was evaluated using both E&P Assumptions and costs and Initial Assumptions and costs. Each of these evaluations was completed by utilizing the B/C Tool in a series of database iterations. For the E&P Assumptions, the iteration numbering nomenclature was “Iteration 1.xx”, with each new iteration assigned a new number for tracking purposes. Similarly, for the Initial Assumptions, the iteration numbering nomenclature was “Iteration

3.xx”, with each new iteration assigned a new number for tracking purposes. Complete analysis packages for all projects are summarized in Section 4.5; complete packages are included in Appendices A1 through B1.

In addition, four lists were generated from the E&P Assumptions and costs analysis:

1. Cost-Effective List
2. Select List
3. Regional List
4. 30-Percent I/I Reduction List

### 4.3 Candidate Regional Conveyance System Improvement (CSI) Projects

To compare the benefits and costs of proposed I/I reduction projects to those of conveyance system improvement (CSI) projects, it was necessary to identify and evaluate the CSI projects that were likely candidates for elimination or reduction. This process was first presented in Section 3.2. A list of candidate CSI projects from the Regional Needs Assessment is presented in Table 3-12.

The County maintained a list of capital projects, the CSI Project List, which was originally generated for the Regional Needs Assessment. Each capital project on the list was comprised of one or more individual conveyance system facility improvements.

The CSI Project List was the starting point for the benefit/cost analysis (see Section 4.2 for a description of how the Baseline Project List was used as input into the B/C Tool). The CSI Project List included a target for I/I flow reduction that would eliminate each conveyance facility improvement, and an estimated capital cost for each.

The locations of planned CSI projects are shown in Figure 3-9. Each facility (pipeline or pump station) within the regional conveyance system receives sewage flow from upstream mini-basins. The point of connection of each mini-basin to the regional conveyance system was identified through review of GIS and as-built documentation provided by local agency sewer systems. This information provided the basis for understanding which portions of the regional conveyance system are impacted by elevated levels of I/I.

To determine if proposed I/I reduction projects in mini-basins tributary to a particular regional conveyance system improvement might be cost effective, it was necessary to achieve a flow reduction threshold at the regional conveyance system facility, or at associated upstream or downstream facilities, that triggered a significant reduction in the required conveyance facility improvement investment, such as a smaller pipe size, fewer pumps, or a flow reduction significant enough to eliminate the need for the planned conveyance system facility

improvement. This was achieved through an iterative process using the B/C Tool described earlier in Section 4.2.

## 4.4 Confidence Factors

As is typical when flows are modeled, the quality of the results varied from basin to basin. Several factors influenced the confidence that could be placed in modeling results and the certainty with which the results could be used in the benefit/cost analysis. The most significant factors included:

- Quality and accuracy of calibrated flow and rainfall data
- Quality of the simulation match to measured flow
- Results of the mini-basin/model basin apportionment process, particularly where high or low apportionment factors were derived

These level of confidence factors were utilized when evaluating mini-basin flows as potential targets for I/I reduction. Confidence factors for each mini-basin are described in Section 3.2.4.8 and are presented in more detail in Appendices A1 through B1.

## 4.5 Identified Cost-Effective I/I Projects

### 4.5.1 CSI Project Lists

#### **Baseline Project List**

The Baseline Project List is a list of conveyance facility improvement projects as identified in the Regional Needs Assessment (see Section 3.2.4.9 and Table 3-12).

#### **Cost-Effective List**

The Cost-Effective List presents the results of the cost-effectiveness analysis and I/I reduction levels achieved if Alternative 3 were implemented. Alternative 3 is designed to identify specific I/I reduction projects that are cost effective based on their own cost savings, compared with conveying and treating their own I/I flows (see Section 3.2.6).

The Cost-Effective List contains all projects with a benefit/cost ratio greater than 1. Using the E&P-Approved Assumptions and costs analysis, nine projects were identified that would eliminate, reduce, or delay the planned facilities. These nine projects were assigned an iteration number of 1.60 and are listed in Table 4-3.

In Table 4-3, the “Capital Facility Cost Reduction” column shows the total cost savings associated with the proposed I/I work at a given facility for a specific iteration. This Capital Facility Cost Reduction number includes monies saved from the reduction/deletion of the facility listed as well as upstream and downstream facilities. The “I/I Rehab” column shows the actual cost of implementing I/I remediation work. The “B/C Ratio” (benefit/cost ratio) column shows the Capital Facility Cost Reduction number divided by the I/I Rehab cost. If the benefit/cost ratio is greater than 1, the project would save more money than it costs.

Table 4-3. Cost-Effective Project List

CSI No.	Itm.	Project (Facility)	I/I Available (mgd)	I/I Reduction (mgd)	Benefit: Capital Facility Cost Reduction	Cost: I/I Rehab	B/C Ratio	No. of Private Properties
60	1.60	South Renton Interceptor (RE*SRENTON.R18-16(9))	7.0	0.81	\$7,270,000	\$2,217,645	3.3	119
58	1.60	ULID 1 Contract 4 (RE*ULID 1-4.S-31(8))	5.5	1.08	\$2,410,000	\$999,123	2.4	101
55	1.60	Auburn 3 New Storage (Auburn3 Twin Tube Storage)	52.8	6.87	\$22,990,000	\$11,362,511	2.0	1,176
59	1.60	Issaquah 2 Trunk (RE*ISSAQ2.R17-40(3))	5.4	1.05	\$5,770,000	\$3,964,850	1.5	395
33	1.60	Bryn Mawr Storage (Bryn Mawr Tube Storage)	16.2	2.04	\$8,510,000	\$6,018,534	1.4	557
47	1.60	Lk Hills Trunk 3 <sup>rd</sup> Barrel Upgrade (WE*LKHILLST.ENTR(3))	10.8	2.20	\$14,438,000	\$11,307,052	1.3	1,086
41	1.60	Eastgate Storage and Trunk (Eastgate Tube Storage)	8.7	3.55	\$16,629,000	\$14,459,862	1.2	1,163
35	1.60	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-05(7))	10.4	2.39	\$12,058,000	\$10,550,378	1.1	976
46	1.60	Garrison Creek Trunk (RE*ULID 1-5.57I(10))	5.7	2.12	\$13,660,000	\$12,013,489	1.1	1,275

## Notes:

1. Identified projects are based on E&P-Approved Assumptions.
2. The projects at the Eastgate Tube Storage and RE\*ISSAQ2.R17-40(3) are interrelated and should be considered as one project for construction.
3. Capital facility modeling for the Eastgate Trunk facilities was updated since the *Regional Needs Assessment Report* was published in March 2005. The updated project now includes the new Eastgate Storage facility.

Completion of these I/I projects would save the County approximately \$31 million. It is estimated that approximately 22 million gallons per day (mgd) of I/I would be removed, which is roughly 5 percent of the total I/I in the County's system.

## Select List

The Select List (Table 4-4) contains all projects on the Cost-Effective List and all remaining non-cost-effective projects, assuming that the projects on the Cost-Effective List have been completed.

The purpose of the Select List is to present all planned conveyance system improvement project identified in the Regional Needs Assessment in order of their respective I/I reduction benefit/cost ratios.

Facilities with an iteration number of 1.61 are directly impacted by a cost-effective project. Those facilities with a Capital Facility Cost Reduction and an I/I Rehab cost equal to zero were deleted by a cost-effective project. All 55 proposed facilities are shown on this list.

**Table 4-4. Select Project List**

<b>Itm.</b>	<b>Project (Facility)</b>	<b>I/I Available (mgd)</b>	<b>I/I Reduction (mgd)</b>	<b>Benefit: Capital Facility Cost Reduction</b>	<b>Cost: I/I Rehab</b>	<b>B/C Ratio</b>
1.60	South Renton Interceptor (RE*SRENTON.R18-16(9))	7.0	0.81	\$7,270,000	\$2,217,645	3.3
1.60	ULID 1 Contract 4 (RE*ULID 1-4.S-31(8))	5.5	1.08	\$2,410,000	\$999,123	2.4
1.60	Auburn 3 New Storage (Auburn3 Twin Tube Storage)	52.8	6.87	\$22,990,000	\$11,362,511	2
1.60	Issaquah 2 Trunk (RE*ISSAQ2.R17-40(3))	5.4	1.05	\$5,770,000	\$3,964,850	1.5
1.60	Bryn Mawr Storage (Bryn Mawr Tube Storage)	16.2	2.04	\$8,510,000	\$6,018,534	1.4
1.60	Lk Hills Trunk 3 <sup>rd</sup> Barrel Upgrade (WE*LKHILLST.ENTR(3))	10.8	2.20	\$14,438,000	\$11,307,052	1.3
1.60	Eastgate Storage and Trunk (Eastgate Tube Storage)	8.7	3.55	\$16,629,000	\$14,459,862	1.2
1.60	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-05(7))	10.4	2.39	\$12,058,000	\$10,550,378	1.1
1.60	Garrison Creek Trunk (RE*ULID 1-5.57I(10))	5.7	2.12	\$13,660,000	\$12,013,489	1.1
1.61	Eastgate Storage and Trunk (RE*EGATE.R11-67(2))	29.8	2.31	\$7,350,000	\$9,788,577	0.75
1.61	Issaquah Storage (Issaquah Tube Storage)	14.0	2.51	\$7,810,000	\$11,790,996	0.66
1.10	Richmond Beach Storage (Richmond Beach Triple Tube)	14.3	4.09	\$15,560,000	\$28,975,090	0.54
1.10	Medina Storage (Medina Tube Storage)	3.8	0.78	\$1,820,000	\$3,486,033	0.52
1.10	Sammamish Plateau Storage (Sammamish Plat.Tunnel Stg.)	5.1	3.03	\$290,000	\$568,018	0.51
1.10	N. Mercer & Enatai Interceptor (Sweyoloken Microtunnel)	11.9	4.64	\$10,418,000	\$20,884,416	0.50
1.10	N. Mercer & Enatai Interceptor (East Channel Siphon)	9.7	4.64	\$10,412,000	\$20,884,416	0.50

<b>ltn.</b>	<b>Project (Facility)</b>	<b>I/I Available (mgd)</b>	<b>I/I Reduction (mgd)</b>	<b>Benefit: Capital Facility Cost Reduction</b>	<b>Cost: I/I Rehab</b>	<b>B/C Ratio</b>
1.10	N. Mercer & Enatai Interceptor (North Mercer Interceptor 1)	10.6	4.63	\$10,411,000	\$20,884,416	0.50
1.10	N. Mercer & Enatai Interceptor (North Mercer Interceptor 2)	10.6	4.63	\$10,411,000	\$20,884,416	0.50
1.61	Auburns West Valley - C ([CSI]AUBWVAL-C)	15.0	1.06	\$1,840,000	\$3,732,106	0.49
1.10	Issaquah Crk. Highlands Stg. (Issaquah Creek Tube Storage)	3.1	1.28	\$2,760,000	\$5,784,296	0.48
1.61	Heathfield/Sunset PS & FM (RE*ISSAQ1.SUNSET(1)FM)	21.0	4.90	\$12,060,000	\$25,927,887	0.47
1.61	Heathfield/Sunset PS & FM (SUNSET PUMP STATION)	21.0	4.05	\$10,310,000	\$23,451,983	0.44
1.61	Heathfield/Sunset PS & FM (RE*ISSAQ1.HEATHFIEL(1)FM)	21.0	4.06	\$10,310,000	\$23,549,181	0.44
1.61	Heathfield/Sunset PS & FM (Heathfield Pump Station)	21.0	4.06	\$10,310,000	\$23,549,181	0.44
1.61	Auburns West Valley - A ([CSI]AUBWVAL-A)	4.9	1.21	\$2,100,000	\$5,260,835	0.40
1.61	Auburns West Valley - B ([CSI]AUBWVAL-B)	14.1	1.31	\$2,250,000	\$6,747,525	0.33
1.10	Boeing Creek Storage Extension (Boeing Creek Tube Storage)	5.9	3.54	\$10,230,000	\$34,132,369	0.30
1.61	NW Lk Sammamish Interceptor (WE*LKHILLST.T-17A(2))	9.8	1.43	\$3,592,000	\$14,642,366	0.25
1.61	NW Lk Sammamish Interceptor (WE*LKHILLST.T-04(3))	12.8	1.68	\$3,551,000	\$14,943,805	0.24
1.61	NW Lk Sammamish Interceptor (WE*NWLKSAM.R19D-27(18))	17.1	3.10	\$5,655,000	\$24,944,620	0.23
1.61	NW Lk Sammamish Interceptor (WE*NWLKSAM.R19D-08(9))	21.4	3.26	\$5,541,000	\$27,143,897	0.20
1.01	Garrison Creek Trunk (RE*GARISN.R18-06(8))	3.8	1.12	\$1,910,000	\$10,588,316	0.18
1.61	NW Lk Sammamish Interceptor (WE*NWLKSAM.R19D-32A(6))	13.1	2.15	\$3,612,000	\$20,533,762	0.18
1.61	Algona Pacific Trunk Stage 1 (RE*ALPAC.238(9))	3.1	0.16	\$310,000	\$1,996,267	0.16
1.61	Algona Pacific Trunk Stage 1 (RE*ALPAC.PS 2(1)FM)	3.1	0.16	\$310,000	\$1,996,267	0.16
1.61	Lakeland Trunk (RE*LAKELAND.02(3))	7.2	9.64	\$200,000	\$1,486,691	0.13

<b>ltn.</b>	<b>Project (Facility)</b>	<b>I/I Available (mgd)</b>	<b>I/I Reduction (mgd)</b>	<b>Benefit: Capital Facility Cost Reduction</b>	<b>Cost: I/I Rehab</b>	<b>B/C Ratio</b>
1.61	Lakeland Hills PS Upgrade (Lakeland Hills Pump Station)	2.3	9.55	\$200,000	\$1,486,691	0.13
1.61	Stuck River Diversion 2 ([CSI]STUCK2)	7.5	9.64	\$200,000	\$1,486,691	0.13
1.01	Rainier Vista Trunk (WE*RVISTA.W314-34(2))	8.5	5.1	\$640,000	\$5,957,016	0.11
1.10	Thornton Creek Interceptor - 3 ([CSI]THRCRK-3)	52.4	5.00	\$280,000	\$3,752,431	0.075
1.10	North Soos Creek Interceptor (RE*NSOOS.382(7) )	3.8	0.55	\$220,000	\$3,732,106	0.059
1.10	Thornton Creek Interceptor - 2 ([CSI]THRCRK-2)	62.6	20.40	\$5,910,000	\$101,155,463	0.058
1.01	Swamp Creek Parallel ([CSI]SwCr1B)	10.4	3.15	\$750,000	\$14,189,182	0.053
1.10	Coal Creek Trunk Replacement ([CSI]COAL)	10.7	3.81	\$440,000	\$12,867,565	0.034
1.10	Mill Creek Relief Sewer ([CSI]MILLCRRELIEF(1))	10.4	2.96	\$540,000	\$19,716,595	0.027
1.01	Bellevue Influent Trunk (RE*BELLINF.RO7-06(6))	8.9	4.51	\$190,000	\$11,594,139	0.016
1.10	Thornton Creek Interceptor - 1 ([CSI]THRCRK-1)	22.7	7.80	\$570,000	\$43,282,181	0.013
1.61	NW Lk Sammamish Interceptor (WE*NWLKSAM.R19D-09(1))	17.1	0.00	\$1,620,000	\$0	0.000
1.10	North Creek 1-A ( [CSI]NC3-A(1))	19.4	0.00	\$0	\$0	0.000
1.01	Sammamish Plateau Diversion ([CSI]Sammamish Diversion)	1.0	0.00	\$0	\$0	0.000
1.61	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-19(7))	5.3	0.00	\$0	\$0	0.000
1.61	Algona Pacific Trunk Stage 2 (RE*ALPAC.256(7))	3.1	0.00	\$0	\$0	0.000
1.10	North Creek Trunk (WW*NCREEK_76-1.44(8))	3.5	0.60	\$0	\$6,664,476	0.000
1.61	Stuck River Diversion 1 ([CSI]STUCK1)	4.9	0.00	\$0	\$0	0.000
1.61	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-25(8))	4.0	0.00	\$0	\$0	0.000

**Notes:**

1. An original analysis of 59 of the 63 facilities was completed because the following four facilities were removed from the final Select List; they were already under construction or too far along in the development process to be modified: (a)

Wilburton Pump Station; (b) RE\*KIRKLAND.R04-01(3); (c) Kirkland Pump Station; and (d) RE\*KIRKLAND.KIRKLAND (1) FM.

2. Capital facility modeling for the Eastgate Trunk facilities was updated since the *Regional Needs Assessment Report* was published in March 2005. The updated project now includes the new Eastgate Storage facility.

## **Regional List**

The Regional List (Table 4-5) contains all projects on the Cost-Effective List and other selected non-cost-effective projects. The purpose of the Regional List was to present the analysis of the cost effectiveness and I/I reduction levels achieved if Alternative 2 were implemented.

Alternative 2 identifies those I/I reduction projects that could be implemented if the cost savings realized from the cost-effective projects were reinvested to fund additional I/I reduction projects as needed until the savings from cost-effective reduction projects are used up and the overall cost of I/I reduction equals the cost of regional conveyance and treatment of equivalent I/I flows (see Section 3.2.6).

The selection of non-cost-effective I/I projects for this list was made using several criteria, including project location, deletion of related facilities, and the benefit/cost ratio. The non-cost-effective I/I reductions projects selected for this list were not necessarily the closest to being cost effective or ones that might eliminate the most I/I. Projects were selected based on their ability to eliminate or reduce planned conveyance facility improvements that would also have ongoing operations and maintenance costs. This is typically the situation for pump stations or storage facilities.

Table 4-5. Regional Project List

Itn.	Project (Facility)	I/I Available (mgd)	I/I Reduction (mgd)	Benefit: Capital Facility Cost Reduction	Cost: I/I Rehab	B/C Ratio
1.60	South Renton Interceptor (RE*SRENTON.R18-16(9))	7.0	0.81	\$7,270,000	\$2,217,645	3.3
1.60	ULID 1 Contract 4 (RE*ULID 1-4.S-31(8))	5.5	1.08	\$2,410,000	\$999,123	2.4
1.60	Auburn 3 New Storage (Auburn3 Twin Tube Storage)	52.8	6.87	\$22,990,000	\$11,362,511	2
1.60	Issaquah 2 Trunk (RE*ISSAQ2.R17-40(3))	5.4	1.05	\$5,770,000	\$3,964,850	1.5
1.60	Bryn Mawr Storage (Bryn Mawr Tube Storage)	16.2	2.04	\$8,510,000	\$6,018,534	1.4
1.60	Lk Hills Trunk 3 <sup>rd</sup> Barrel Upgrade (WE*LKHILLST.ENTR(3))	10.8	2.20	\$14,438,000	\$11,307,052	1.3
1.60	Eastgate Storage and Trunk (Eastgate Tube Storage)	8.7	3.55	\$16,629,000	\$14,459,862	1.2
1.60	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-05(7))	10.4	2.39	\$12,058,000	\$10,550,378	1.1
1.60	Garrison Creek Trunk (RE*ULID 1-5.57I(10))	5.7	2.12	\$13,660,000	\$12,013,489	1.1
1.1	Richmond Beach Storage (Richmond Beach Triple Tube)	14.3	4.09	\$15,560,000	\$28,975,090	0.54
1.1	Medina Storage (Medina Tube Storage)	3.8	0.78	\$1,820,000	\$3,486,033	0.52
1.1	N. Mercer & Enatai Interceptor (East Channel Siphon)	9.7	4.64	\$10,412,000	\$20,884,416	0.50
1.1	Issaquah Crk. Highlands Stg. (Issaquah Creek Tube Storage)	3.1	1.28	\$2,760,000	\$5,784,296	0.48

Note:

Capital facility modeling for the Eastgate Trunk facilities was updated since the *Regional Needs Assessment Report* was published in March 2005. The updated project now includes the new Eastgate Storage facility.

### 30-Percent I/I Reduction List

The purpose of the 30-percent reduction simulation was to present the analysis of the cost effectiveness of implementing Alternative 1. Alternative 1 is designed to reduce I/I levels by 30 percent system-wide, as identified in the RWSP (see Section 3.2.6).

The analysis evaluated the cost of removing 135 million gallons per day (mgd) of I/I from the County system. This amount is 30 percent of the County's estimated 450 mgd of I/I. To achieve 30-percent reduction in I/I, it was estimated to cost approximately \$398 million for I/I reduction while saving only \$116 million in conveyance system improvement costs.

The mini-basins where I/I removal was most cost effective (least cost-per-gallon) were included in the analysis until the 135-mgd target was reached. All the utilized mini-basins had at least 3,500 gallons per acre per day (gpad) of I/I after rehabilitation, and no “No Confidence” mini-basins were included (see Section 3.2.4.8 for a description of confidence levels).

## 4.6 Sensitivity Analysis of Selected Projects (Alternative 3: Project-Specific)

As described in Section 3.2.5.3, Initial Assumptions about I/I reduction were prepared and submitted to the E&P Subcommittee for consideration. These Initial Assumptions were modified by a consensus of the E&P Subcommittee with the primary differences between the two sets of assumptions being: (a) the I/I reduction factors, (b) the limit for the minimum gallons per acre per day (gpad) remaining after I/I reduction, and (c) the unit costs used for I/I rehabilitation techniques. The Initial Assumptions were less conservative than the E&P Assumptions, and were based on the observed results from the pilot projects (see Section 3.2.5 for a description of the pilot projects). To put an upper limit on the potential savings available to the County through I/I reduction, these Initial Assumptions were used to complete a Sensitivity Analysis at the request of the E&P Subcommittee.

The Sensitivity Analysis used assumptions that represented the higher end of the expected performance range to determine the impact on the benefit/cost analysis results. The Initial Assumptions included lower costs, higher effectiveness, and less work effort to achieve assumed I/I reduction rates.

The efficiency of the I/I remediation techniques was generally given a higher efficiency factor in the Initial Assumptions compared with the E&P-Approved Assumptions (see Table 4-6 for the efficiency assumptions). The percent I/I reduction by Techniques 1 and 2 was 5 percent higher, and the percent reduction for Technique 4 was 15 percent higher. The reduction for Technique 3 was the same for both sets of assumptions. The I/I reduction assumptions used in the Sensitivity Analysis are shown in Tables 4-6 and 4-7.

**Table 4-6. Efficiency Assumptions by Technique**

	<b>Technique</b>	<b>E&amp;P Efficiency Assumptions</b>	<b>Initial Efficiency Assumptions</b>
1	Direct disconnects (DD)	10%	15%
2	Replace everything and DD	80%	80%
3	Replace public sewers and DD	40%	45%
4	Private property with some laterals and DD	60%	60%

The gpad limit necessary to perform remediation on mini-basins also varied between the Initial and E&P-Approved Assumptions for cost. The gpad threshold was modified from 3,500 gpad (E&P-Approved Assumptions) to 1,500 gpad (Initial Assumptions). This created a larger pool of mini-basins for use in the Initial Assumptions analysis than for the E&P-Approved Assumptions analysis.

The cost to perform I/I remediation under the Initial Assumptions was less than the cost for the E&P-Approved Assumptions.

**Table 4-7. Sensitivity Analysis Unit Cost  
by I/I Reduction Technique, Initial Assumptions**

Technique	Description	Assumed Unit Costs
1	Direct disconnects (DD)	\$1,000 each
2	Replace everything and DD	Sewer mains: \$90/linear foot Manholes: \$2,800 each Laterals: \$3,900 each Side sewers: \$2,800 each Direct disconnects: \$1,000 each
3	Replace public sewers and DD	Sewer mains: \$90/linear foot Manholes: \$2,800 each Laterals: \$3,900 each Direct disconnects: \$1,000 each
4	Private property and some laterals and DD	Laterals: \$3,900 each Side sewers: \$2,800 each Direct disconnects: \$1,000 each

Specific cost-effective projects were ranked on a priority basis, as summarized and presented in Table 4-8. Total I/I removed was estimated at approximately 59 mgd (13 percent). Total cost of the I/I reduction projects was calculated at approximately \$107 million. The impact on County facilities resulted in an estimated cost savings of \$217 million by eliminating the need for 28 conveyance facility improvement projects and reducing the size or capacity of 12 facilities. The result would be an overall cost savings of approximately \$110 million.

**Table 4-8. Alternative 3: Cost-Effective/Project-Specific I/I Removal Summary,  
Initial Assumptions**

Total I/I Removed	Total I/I Rehabilitation Costs	Total Capital Facility Savings (Benefit)	Total County Savings	% I/I Removed	Number of Facilities Eliminated	Number of Facilities Downsized
58.7 mgd	\$106,852,000	\$216,529,000	\$109,700,000	13.0	28	12

The Sensitivity Analysis, which used the Initial Assumptions for cost, yielded another iteration of the Select List (see Table 4-9). The Select List contains all projects on the Cost-Effective List and all remaining non-cost-effective projects, assuming that the projects on the Cost-Effective List have been completed.

Those facilities with an iteration number of 3.10 and a benefit/cost ratio less than 1 are directly impacted by a cost-effective project. Those facilities with a Capital Facility Cost Reduction and an I/I Rehab cost equal to zero were replaced on the list with a cost-effective project. All 55 proposed facilities are shown on this list.

**Table 4-9. Select Project List, Sensitivity Analysis**

<b>ltn.</b>	<b>Project (Facility)</b>	<b>I/I Available (mgd)</b>	<b>I/I Reduction (mgd)</b>	<b>Benefit: Capital Facility Cost Reduction</b>	<b>Cost: I/I Rehab</b>	<b>B/C Ratio</b>
3.10	ULID 1 Contract 4 (RE*ULID 1-4.S-31(8))	5.5	1.23	\$2,410,000	\$503,115	4.8
3.10	South Renton Interceptor (RE*SRENTON.R18-16(9))	7.0	0.81	\$7,270,000	\$2,217,645	3.3
3.10	Garrison Creek Trunk (RE*ULID 1-5.57I(10))	5.7	2.31	\$13,660,000	\$4,381,782	3.1
3.10	Bryn Mawr Storage (Bryn Mawr Tube Storage)	16.2	2.55	\$9,560,000	\$3,434,053	2.8
3.10	NW Lk Sammamish Interceptor (WE*NWLKSAM.R19D-27(18))	17.1	8.16	\$44,329,000	\$18,257,229	2.4
3.10	Heathfield/Sunset PS & FM (RE*ISSAQ1.SUNSET(1)FM)	21.0	4.64	\$16,232,000	\$7,145,990	2.3
3.10	Auburn 3 New Storage (Auburn3 Twin Tube Storage)	52.8	14.17	\$44,520,000	\$19,857,837	2.2
3.10	Eastgate Storage and Trunk (Eastgate Tube Storage)	8.7	4.82	\$19,719,000	\$9,529,936	2.1
3.10	Coal Creek Trunk Replacement ([CSI]COAL)	10.7	5.62	\$15,300,000	\$8,974,170	1.7
3.10	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-05(7))	10.4	5.81	\$19,218,000	\$12,962,235	1.5
3.10	N. Mercer & Enatai Interceptor (Sweyoloken Microtunnel)	11.9	8.43	\$24,311,000	\$20,545,818	1.2
3.01	Richmond Beach Storage (Richmond Beach Triple Tube)	14.3	5.11	\$15,710,000	\$16,532,597	0.95
3.01	Medina Storage (Medina Tube Storage)	3.8	0.99	\$1,820,000	\$1,989,060	0.92
3.01	North Soos Creek Interceptor (RE*NSOOS.382(7) )	3.8	2.04	\$5,960,000	\$8,208,872	0.73

**Chapter 4. Benefit/Cost Analysis**

<b>Itm.</b>	<b>Project (Facility)</b>	<b>I/I Available (mgd)</b>	<b>I/I Reduction (mgd)</b>	<b>Benefit: Capital Facility Cost Reduction</b>	<b>Cost: I/I Rehab</b>	<b>B/C Ratio</b>
3.01	North Creek Trunk (WW*NCREEK_76-1.44(8))	3.5	1.30	\$4,230,000	\$6,638,779	0.64
3.01	North Creek 1-A ( [CSI]NC3-A(1))	19.4	7.2	\$13,210,000	\$22,140,575	0.59
3.10	Algona Pacific Trunk Stage 1 (RE*ALPAC.238(9))	3.1	0.56	\$2,230,000	\$3,772,193	0.59
3.10	Algona Pacific Trunk Stage 1 (RE*ALPAC.PS 2(1)FM)	3.1	0.56	\$2,230,000	\$3,772,193	0.59
3.01	Rainier Vista Trunk (WE*RVISTA.W314-34(2))	8.5	2.45	\$640,000	\$1,276,215	0.50
3.01	Boeing Creek Storage Extension (Boeing Creek Tube Storage)	5.9	4.43	\$7,750,000	\$19,475,235	0.40
3.10	Auburns West Valley - C ([CSI]AUBWVAL-C)	15.0	1.62	\$2,740,000	\$7,228,588	0.38
3.10	Auburns West Valley - B ([CSI]AUBWVAL-B)	14.1	1.61	\$2,560,000	\$7,217,290	0.35
3.10	Stuck River Diversion 2 ([CSI]STUCK2)	7.5	0.39	\$1,000,000	\$3,066,005	0.33
3.10	Issaquah Storage (Issaquah Tube Storage)	14.0	1.77	\$1,230,000	\$4,276,479	0.29
3.10	NW Lk Sammamish Interceptor (WE*LKHILLST.T-17A(2))	9.8	0.78	\$750,000	\$3,176,645	0.24
3.10	Stuck River Diversion 1 ([CSI]STUCK1)	4.9	0.18	\$240,000	\$1,079,285	0.22
3.01	Thornton Creek Interceptor - 3 ([CSI]THRCRK-3)	52.4	13.40	\$3,370,000	\$16,801,705	0.20
3.10	Heathfield/Sunset PS & FM (SUNSET PUMP STATION)	21.0	6.01	\$4,467,000	\$22,616,195	0.20
3.10	Heathfield/Sunset PS & FM (RE*ISSAQ1.HEATHFIEL(1)FM)	21.0	6.01	\$4,459,000	\$22,616,195	0.20
3.10	Heathfield/Sunset PS & FM (Heathfield Pump Station)	21.0	6.01	\$4,095,000	\$22,616,195	0.18
3.10	Eastgate Storage and Trunk (RE*EGATE.R11-67(2))	29.8	7.54	\$4,458,000	\$28,023,512	0.16
3.01	Thornton Creek Interceptor - 2 ([CSI]THRCRK-2)	62.6	24.49	\$6,850,000	\$51,855,959	0.13
3.01	Swamp Creek Parallel ([CSI]SwCr1B)	10.4	4.46	\$480,000	\$7,038,803	0.068
3.01	Mill Creek Relief Sewer ([CSI]MILLCRRELIEF(1))	10.4	4.93	\$960,000	\$17,123,465	0.056

<b>Itm.</b>	<b>Project (Facility)</b>	<b>I/I Available (mgd)</b>	<b>I/I Reduction (mgd)</b>	<b>Benefit: Capital Facility Cost Reduction</b>	<b>Cost: I/I Rehab</b>	<b>B/C Ratio</b>
3.01	Bellevue Influent Trunk (RE*BELLINF.RO7-06(6))	8.8	6.05	\$300,000	\$7,318,570	0.041
3.01	Thornton Creek Interceptor - 1 ([CSI]THRCRK-1)	22.7	10.13	\$570,000	\$27,449,025	0.021
3.10	N. Mercer & Enatai Interceptor (North Mercer Interceptor 1)	10.6	0.00	\$0	\$0	0
3.10	Lk Hills Trunk 3 <sup>rd</sup> Barrel Upgrade (WE*LKHILLST.ENTR(3))	10.8	0.00	\$0	\$0	0
3.10	Issaquah Crk. Highlands Stg. (Issaquah Creek Tube Storage)	3.1	0.00	\$0	\$0	0
3.10	Issaquah 2 Trunk (RE*ISSAQ2.R17-40(3))	5.4	0.00	\$0	\$0	0
3.02	Sammamish Plateau Diversion ([CSI]Sammamish Diversion)	1.0	0.27	\$0	\$2,578,173	0
3.10	Lakeland Hills PS Upgrade (Lakeland Hills Pump Station)	2.3	0.00	\$0	\$0	0
3.10	Garrison Creek Trunk (RE*GARISN.R18-06(8))	3.8	0.00	\$0	\$0	0
3.10	N. Mercer & Enatai Interceptor (East Channel Siphon)	9.7	0.00	\$0	\$0	0
3.10	Algona Pacific Trunk Stage 2 (RE*ALPAC.256(7))	3.1	0.00	\$0	\$0	0
3.10	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-25(8))	4.0	0.00	\$0	\$0	0
3.10	Lakeland Trunk (RE*LAKELAND.02(3))	7.2	0.00	\$0	\$0	0
3.10	Sammamish Plateau Storage (Sammamish Plat. Tunnel Stg.)	5.1	0.00	\$0	\$0	0
3.10	NW Lk Sammamish Interceptor (WE*NWLKSAM.R19D-32A(6))	13.1	0.00	\$0	\$0	0
3.10	Wilburton PS / Factoria Trunk (RE*FACTOR.RO6-19(7))	5.3	0.00	\$0	\$0	0
3.10	NW Lk Sammamish Interceptor (WE*LKHILLST.T-04(3))	12.8	0.00	\$0	\$0	0
3.10	NW Lk Sammamish Interceptor (WE*NWLKSAM.R19D-09(1))	17.1	0.00	\$1,620,000	\$0	0
3.10	NW Lk Sammamish Interceptor (WE*NWLKSAM.R19D-08(9))	21.4	0.00	\$0	\$0	0
3.10	N. Mercer & Enatai Interceptor (North Mercer Interceptor 2)	10.6	0.00	\$0	\$0	0

<b>Itm.</b>	<b>Project (Facility)</b>	<b>I/I Available (mgd)</b>	<b>I/I Reduction (mgd)</b>	<b>Benefit: Capital Facility Cost Reduction</b>	<b>Cost: I/I Rehab</b>	<b>B/C Ratio</b>
3.10	Auburns West Valley - C ([CSI]AUBWVAL-A)	4.9	0.00	\$0	\$0	0

## Notes:

1. An original analysis of 59 of the 63 facilities was completed because the following four facilities were removed from the final Select List: (a) Wilburton Pump Station, (b) RE\*KIRKLAND.R04-01(3), (c) Kirkland Pump Station, and (d) RE\*KIRKLAND.KIRKLAND(1)FM. These projects were already under construction or too far along in the design process to modify.
2. Capital facility modeling for the Eastgate Trunk facilities was updated since the *Regional Needs Assessment Report* was published in March 2005. The updated project now includes the new Eastgate Storage facility.

Descriptions of each cost-effective I/I reduction project (project-specific) are presented in Chapter 5. Figures 5-1 through 5-9 illustrate the locations of mini-basins included in cost-effective projects and the general locations of proposed CSI facilities delayed, reduced, or eliminated by the proposed I/I reduction.